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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/676,099	10/02/2003	Germano Rabach	003-090	8397

36844 7590 11/10/2005

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EXAMINER	
DEB, ANJAN K	

ART UNIT	PAPER NUMBER
2858	

DATE MAILED: 11/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/676,099	RABACH ET AL.
	Examiner	Art Unit
	Anjan K. Deb	2858

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10,15 and 18-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,15 and 18-21* is/are rejected.

7)☒ Claim(s) *1* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This office action is in response to amendment filed 09/06/2005.

Claim Objections

2. Claim 1 is objected to because of the following informalities: In claim 1, the term "electrically disconnected" appears to be improper because the sensor is coupled to the device under test electromagnetically as required for sensing operation. An alternative term such as "without a wired connection" is suggested. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-4, 6, 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Shiota et al. (US 6,114,871).

Re claim 1, Shiota et al. discloses method of detecting partial discharges in windings of electrical device (electrical motor) comprising applying voltages having high frequency components to windings of the electrical device (column 11 lines 48-60)(Fig. 5), plurality of tuned VHF or UHF electromagnetic field sensors 9a, 9b, 9c (Fig. 26a) sequentially arranged at a

plurality of positions close to the electrical device and electrically disconnected (without a wired connection) from the electrical device (installed in close vicinity to the stator winding 4 as shown in Fig. 26a)(column 29 lines 54-63) to determine the position of discharge location and evaluating the detected sensor signals using electrical hardware (Fig. 25). The sensors are broadly interpreted as tuned VHF or UHF sensor since they are operating in the VHF or UHF frequency range (up to 200 MHz)(Fig. 3, Fig. 7a-c, Fig. 22) and tuned for detecting resonance frequencies. Regarding applying high frequency components (radio noises, pulse-shaped thyristor noises) are being routinely applied during normal operation of the electric equipment (column 3 lines 35-47) and Shiota is able to detect partial discharge signals from these input signals.

Re claim 2, Shiota et al. discloses applying test pulse voltage by a pulse generator (column 11, lines 48-53) and partial discharge sensor detects the partial discharge signal having the characteristic shown in FIG. 5.

Re claims 3,9 Shiota et al. disclose plurality of sensors comprise at least three sensors 9a, 9b, 9c (Fig. 26 a) wherein at least one sensor is located near the coils 4 connected to high voltage source (Fig. 26a).

Re claim 4, Shiota et al. disclosed applied test voltage comprises high frequency AC or a DC voltage or a frequency converter output (column 3 lines 35-47).

Re claim 6, Shiota et al. discloses filtering detected sensor signals by a conditioning circuit (filter circuits 23)(Fig. 25).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 7, 8, 10, 15, 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiota et al. (US 6,114,871).

Re claim 7, 8 Shiota et al. disclosed all of the claimed limitations except filtering detected signals with a software filter and characterizing discharge patterns using stochastic analysis.

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify Shiota et al. by adding a software filter for digital filtering of detecting signals and by including stochastic[1] analysis (separating partial discharge signals from the radio noises) as part of a digital signaling processing system for detecting partial discharge since Shiota et al. disclosed processing of detected signals by separating partial discharge signals from radio noises.

[1] Stochastic = random or noise

Re claim 10, Shiota et al. disclosed all of the claimed limitations including rejecting noise signals by a filter circuit and at least two high frequency sensors except wherein the two high frequency sensors are positioned near to the machine's high voltage terminal and to the low voltage terminal, respectively, and further comprising, inferring the discharge position along the winding, or both, using a differential measuring mode.

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify Shiota et al. by positioning two high frequency sensors near to the machine's high voltage terminal and to the low voltage terminal, respectively, for making differential measuring mode for eliminating noise signals.

Re claim 15, Shiota did not expressly disclose software filter based on the Fast Fourier Transformation (FFT) but would have been obvious to do so since Shioto disclosed obtaining the frequency spectrum of signal (column 5 lines 1-8).

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify Shiota et al. by adding FFT software filter for obtaining the frequency spectrum of partial discharge signal for detecting the source of partial discharge signal (column 5 lines 1-8).

Re claims 18,19 Shiota et al. disclosed all of the claimed limitations including VHF or UHF electromagnetic sensors 9a, 9b, 9c (Fig. 26a) for detecting partial discharge signals up to 200 MHz frequency (Fig. 3, Fig. 7a-c, Fig. 22) wherein the sensors comprise detection circuit

tuned to measure resonance frequency. Detectors 9a, 9b, 9c are broadly interpreted as linear antenna[2] that are designed to receive electromagnetic waves from coil 4.

Re claim 20, Shiota et al. did not expressly disclose partial discharge detection comprises at least one sensor having a tuned frequency selected to attenuate a test surge signal more than a discharge signal but would have been obvious to do so in order to capture the signal of interest.

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify Shiota et al. by adding a filter or attenuator to attenuate test surge signal in order to capture the signal of interest.

Re claim 21, Shiota et al. did not expressly disclose detecting with at least one sensor located in a freely chosen position.

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify Shiota et al. by positioning at least one sensor in a freely chosen position where there is greater likelihood of detecting a partial discharge.

[2] Antenna = that part of a transmitting or receiving system designed to radiate or to receive electromagnetic waves, IEEE Authoritative Dictionary of IEEE Standard terms, 7th Edition, IEEE Press

7. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shiota et al. (US 6,114,871) in view of Zaengl (US 4,338,561).

Re claim 5, Shiota et al. disclosed all of the claimed limitations as set forth above except applying test surge voltage having variable pulse wherein the repetition rates are different from 50/60 Hz.

Zaengl (US 4,338,561) disclosed method of testing partial discharge (column 7 lines 28-33) on windings of electrical device by applying test surge voltage having variable pulse wherein the repetition rates are different from 50/60 Hz (variable frequency testing system permits testing with frequencies which are higher than the line frequency)(column 2 lines 15-30).

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify Shiota et al. by applying high frequency AC test voltage having variable pulse wherein the repetition rates are different from 50/60 Hz (variable frequency) as disclosed by Zaengl to test the electrical insulations with a frequency higher than, the line frequency, in order to examine winding insulating properties in dependence from the frequency.

Response to Arguments

8. In response to applicant's argument that neither Shiota nor Dister disclose, describe or suggest a method including inter alia, detecting signals using an EM sensor electrically disconnected from the electrical device, applicant is kindly referred to Shiota's disclosure wherein it is stated that the sensors are installed in close vicinity to the stator winding 4

(column 29 lines 54-63) and are "electrically disconnected" (without a wired connection) from the electrical device as shown in Fig. 26a (EMBODIMENT 11) and sensor receives partial discharge signals generated by stator winding by the propagation of electromagnetic waves from stator winding to the sensor by electromagnetic coupling.

In response to applicant's argument that Shiota's method relies on incipient high frequency components of the voltages applied to the windings when on-line, however this feature "on-line" or "off-line" method is not claimed.

The essence of this invention is a method for measuring partial discharge in a device by applying high frequency voltage to the winding of the device, and detecting electromagnetic signals by plurality of EM sensors placed near the windings and without having a wired connection ("electrically disconnected") between the device and the sensor (electromagnetic coupling) so as to determine the position of a discharge location in the device, the prior art cited in this office action (Shiota et al.) disclose this feature.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Campbell (US 4949001) discloses partial discharge detection method and apparatus for detecting partial discharge pulse in high voltage conductor in the stator of a motor, turbine generator or the like, comprising means for transmitting an electrical pulse produced in the signal conductor and recording means for determining the location and severity of partial discharge activity within the high voltage insulation of the conductor.

Kang et al. (US 2003/0214307 A1) discloses UHF sensor for detecting electromagnetic signals from partial discharge in electrical equipment.

Hucker (US 6,255,808 B1) discloses HF 3 and UHF 4 sensor for detecting partial discharge in electrical device (Figure).

Nozari (US 5877606) discloses a routine method of operating synchronous machine comprising applying variable pulse AC voltage having variable width and variable frequency (repetition rates different from 50/60 Hz) produced by static inverter (Fig. 1)(column 2 lines 55-62).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Anjan K. Deb whose telephone number is 571-272-2228. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diane Lee can be reached at 571-272-2399.

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